

BEFORE THE  
**Federal Communications Commission**  
WASHINGTON, D.C. 20554

In the Matter of	)	
	)	
The Establishment of Policies and Service Rules	)	IB Docket No. 02-19
For the Non-Geostationary Satellite Orbit	)	
Fixed-Satellite Service in the Ka-Band	)	
To: The Commission		

**COMMENTS OF TRW Inc.**

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## Summary

The Commission proposes four possible approaches for sharing spectrum among applicants in the second Ka-band NGSO FSS processing round, seeking comment on which option – or variation thereon – can best accommodate the applicants. Each of the four possibilities that the Commission suggests poses particular problems. Neither of the Commission's two band segmentation options is workable in the second Ka-band NGSO FSS processing round. The number of systems proposed – including Teledesic, the sixth system with which sharing is to be effected – is too large for a  $1/n$  division of the available spectrum to permit any one to operate successfully in the minimum spectrum that would be available. In the case of either an avoidance of in-line interference events approach or a homogeneous constellation regime, applicants may have to accept additional complexities in system design and operation or make changes in their system design itself in order to adapt to the designated sharing approach. In the end, however, a hybrid approach combining primarily the elements of these latter two options is preferable to any one of the four specific options outlined in the *NPRM*.

Under the terms of the *NPRM* and a companion order, Teledesic is not entitled to protection from second-round systems, and should be treated for coordination purposes as if it were a sixth entrant in the current round – on equal footing with TRW and the other second round applicants. Teledesic's recently proposed conversion from a LEO system to a MEO system, if granted, should abet this process.

TRW also addresses service rules issues raised in the *NPRM*, as follows:

Financial Qualifications: TRW supports the Commission's tentative conclusion that all pending applicants likely can be accommodated in the available Ka-band NGSO FSS

spectrum, and that this would moot the need for a threshold financial qualification standard. Nonetheless, the Commission should not hesitate to impose strict financial requirements, if necessary. It should not, however, alter its current financial standard through an “earmarking” requirement, as contingently proposed in the *NPRM*.

Implementation Milestones: The Commission should focus on adopting clear and enforceable milestones. The milestones proposed in the *NPRM* do not meet these criteria, but instead substitute complexity for certainty, and would likely be burdensome both for applicants and the agency. The Commission should establish clear requirements for contracting, commencement of construction and satellite completion, and monitor licensee progress through its reporting and certification requirements. Milestones should retain enough flexibility, however, to allow licensees to phase in network deployment.

Reporting Requirements: TRW supports the Commission’s proposals, including its decision to eliminate reporting of unscheduled outages, and the proposal to require licensees to certify milestone compliance, or disclose non-compliance, within ten days.

Orbital Debris Mitigation: TRW is prepared to accept whatever reasonable applicant requirements the Commission concludes are necessary with respect to orbital debris mitigation as the result of its separate *NPRM* concerning this issue.

System License and License Terms: TRW believes that the fifteen-year license term applicable to all other satellite services is now applicable to the Ka-band NGSO FSS, rather than the ten-year term proposed in the *NPRM*.

TRW urges the expeditious conclusion of this proceeding consistent with its comments, and the prompt resolution of the long-pending second Ka-band NGSO FSS processing round.

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TRW Inc. (“TRW”), by its attorneys and pursuant to Sections 1.415 and 1.419 of the Commission’s rules, 47 C.F.R. §§ 1.415 and 1.419, hereby comments on the *Notice of Proposed Rule Making* (“NPRM”) issued February 6, 2002 in the above-captioned proceeding. As the Commission notes in the *NPRM*, TRW is one of the five applicants in the second processing round for Ka-band non-geostationary fixed-satellite service (“NGSO FSS”) systems. Like the other applicants, TRW sought a license more than four years ago, in December 1997. For this reason, it has a strong interest in the expeditious and satisfactory resolution of the matters at issue in this proceeding, so that the Commission can proceed with licensing.

**I. Introduction**

In the *NPRM*, the Commission proposes four possible approaches for sharing spectrum among applicants in the second Ka-band NGSO FSS processing round, “seeking comment on which option – or variation on a proposed option – can best accommodate the applicants.” *NPRM* at 6 (¶ 11). Each of the four possibilities that the

Commission suggests poses particular problems for prospective licensees. In the case of either an avoidance of in-line interference events approach or a homogeneous constellation regime, applicants may have to accept additional complexities in system design and operation or make changes in their system design itself in order to adapt to the designated sharing approach. In the end, however, a hybrid approach combining primarily the elements of these two plans is preferable to either of the two types of band segmentation that are discussed in the *NPRM*. Neither segmentation approach is workable in the second Ka-band NGSO FSS processing round, as the number of systems seeking spectrum access – including Teledesic LLC (“Teledesic”), the sixth system with which sharing is to be effected – is too large for a  $1/n$  division of the available spectrum to permit any one system to operate successfully in the minimum spectrum that would be available.

In the *NPRM*, the Commission addresses the treatment of Teledesic, the Commission’s sole first-round Ka-band NGSO FSS licensee. In both the *NPRM* and a companion order released at the same time,<sup>1</sup> the Commission reiterates that Teledesic is obliged to coordinate with subsequently-licensed U.S. Ka-band NGSO FSS systems, and that Teledesic would have sufficient flexibility to redesign its system to accommodate new entrants if its system parameters were not yet finalized, “as would be evidenced by a subsequent application for authority to modify its licensed system . . . .” *NPRM* at 6-7 (¶ 14).

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<sup>1</sup> See *Teledesic LLC*, FCC 02-6, slip op. at 4 (¶ 19) (released February 6, 2002) (“[I]n the event that Teledesic should seek to modify its system’s parameters instead of constructing its system as authorized, we would find that Teledesic would be in a much better position to make changes to facilitate coordination and accommodation of new entrants. If Teledesic were to significantly alter its system design at this point, it would indicate that Teledesic has not made the kind of progress that would limit its flexibility to incorporate design changes into its system. In this case, sharing the burden equally with new entrants may not impede its progress in implementing its system.”).

On January 31, 2002, the day that the *NPRM* was adopted, Teledesic filed an application to modify its license which proposes changes that TRW has described as requesting authority for “an entirely new system from that which was previously licensed.”<sup>2</sup> Teledesic clearly is not entitled to protection from second-round systems, and thus, at best, should be treated for sharing and coordination purposes as if it were a sixth entrant in the current processing round, with standing equal to that of TRW and the other second round applicants that may be licensed in the round. In other words, Teledesic must bear the full burden of coordinating with the other U.S. second-round systems.

## **II. Comments On Spectrum Sharing Options**

As noted above, the Commission proposes in the *NPRM* four possible approaches for sharing spectrum among applicants in the second Ka-band NGSO FSS processing round, and seeks comment on which one of them or which “variation on a proposed option – can best accommodate the applicants.” *NPRM* at 6 (¶ 11). Each of the four possibilities that the Commission suggests poses particular problems for prospective licensees, and for this reason, TRW does not believe that any single method provides an adequate sharing mechanism. However, studies that have been considered in ITU Working Party 4A of the International Telecommunication Union’s Radiocommunication Sector (“ITU-R”) have suggested that either the use of interference mitigation techniques, such as satellite diversity or frequency isolation, or the adoption of homogenous constellation designs would be preferable for use at Ka-band to other forms of spectrum

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<sup>2</sup> See Comments of TRW Inc., File No. SAT-MOD-20020201-00011, at 1-2 n.1 (filed March 18, 2002).

sharing among NGSO FSS systems.<sup>3</sup> TRW agrees with this assessment, and therefore proposes that the Commission adopt a hybrid approach that combines positive aspects of these two methods, while also incorporating a form of dynamic band segmentation to apply exclusively during in-line interference events.

**A. The Commission Should Conclude That A Hybrid Band Sharing Approach Would Best Promote The Public Interest.**

TRW believes that the limitations of each of the discrete sharing options the Commission has proposed should preclude the adoption of any one of the options as the sole means of advancing multi-system entry in the second Ka-band processing round. Instead, the Commission should look to combine the positive aspects of each plan into a hybrid approach that would work very well in the propagation environment that exists in the 20/30 GHz frequency range.

**1. Overview**

The core organizing principle of TRW's sharing methodology would be requiring licensees to avoid in-line interference events through coordination, as provided in the Commission's Option 3; however, frequency isolation (a type of band segmentation) would also be used in circumstances where such events could not be prevented through system design, including satellite diversity. Finally, the Commission should establish system parameters that applicants must identify in order to facilitate coordination. Identification of critical characteristics of Ka-band NGSO FSS constellations should allow applicants to better gauge the ability of their proposed architecture to co-exist with other proposed systems, and could lead to some *de facto*

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<sup>3</sup> See ITU-R Recommendation S.1431, Methods to enhance sharing between non-GSO FSS systems (except MSS feeder links) in the frequency bands between 10-30 GHz.



level of homogenization, or at least sharing trade-offs, to facilitate the licensing of multiple systems.

Under TRW's suggested approach, each system would be licensed to operate throughout the full NGSO FSS primary spectrum, encompassing 500 MHz of spectrum in the space-to-Earth direction at 18.8-19.3 GHz and the companion 500 MHz of primary NGSO FSS uplink spectrum at 28.6-29.1 GHz.<sup>4</sup> Each system would thus have access to all Ka-band NGSO FSS spectrum under normal conditions. The only potential exception to this general rule would be during the occurrence of in-line events that cannot be avoided through coordination or satellite diversity, in which case the systems involved in the in-line event would have their spectrum assignments default to pre-selected segments of the spectrum for the duration of the in-line event.

## **2. Defining In-Line Events**

The Commission generally describes an in-line event as "an unintentional transmission in either direction between an earth station of one system and a satellite of another caused by physical alignment." *NPRM* at 10 (§ 26). This construction is fine as far as it goes, but requires additional refinement in order to designate at what point the degree of "physical alignment" between or among systems would cause significant interference. TRW believes that in-line events should be defined in terms of angular separation between two satellites of different systems as viewed by an earth station antenna. An in-line interference event should be deemed to occur only when the

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<sup>4</sup> If desired by individual applicants, systems could also be licensed for up to 750 MHz of NGSO secondary uplink spectrum at 28.35-28.6 GHz and 29.5-30 GHz. Although the Commission mentions in the *NPRM* the availability of this latter 500 MHz band for secondary NGSO FSS uplinks, and includes it in the tables in Appendix A, for some reason it omits this band from its later mention of bands available for Ka-band NGSO FSS licensing on a secondary basis. See *NPRM* at 5 (§ 10). This apparently inadvertent oversight should be corrected in the forthcoming Report and Order. In the secondary bands, epfd limits adopted at WRC-2000 for the protection of the geostationary orbit would apply.

topocentric line of sight (“LOS”) angular separation between two NGSO satellites is relatively small, typically on the order of four to five degrees. Greater separation angles are not necessary for most system designs. Indeed, a 5° separation is substantially more conservative in terms of interference protection than the present standard for geostationary (“GSO”) satellites, which are able to operate with permanent 2° separations. Moreover, defining in-line events any more broadly would lead to increased numbers of in-line events without providing any appreciable improvement in interference protection.

The required topocentric LOS angular separation depends on the system parameters. If the systems involved operate with the sensitive interference parameters, such as low fade margin, small earth terminal size with slow antenna roll-off, low system noise temperature, etc., the required topocentric LOS angular can be large -- up to 10°. In order to allow multiple NGSO FSS systems operating in the 20/30 GHz bands, TRW believes that all NGSO FSS applicants should be made to develop a common set of parameters, *i.e.*, uplink e.i.r.p density, downlink power flux density, satellite antenna roll-off, etc., that will enable a stable, common environment to be established.

On a related note, TRW calls upon the Commission to adopt a policy that favors optimization of NGSO FSS constellations in a way that minimizes occurrence of in-line events. The best way to avoid in-line interference is to avoid in-line events in the first place. As discussed below, while imposing a homogeneity requirement on Ka-band NGSO FSS licensees may not be practical (albeit more for political than for technical reasons), standardization of system parameters itself should be formally encouraged.

As in-line events (especially at the more modest separation angle that TRW advocates) will almost never involve more than two satellites at once, even with

full-deployment of six systems, it is up to NGSO system operators to coordinate with each other on how to accommodate in-line events. Frequency separation, satellite diversity, operation on opposite polarizations, and other mitigation techniques are all available to meet these requirements on a case-by-case basis. Assuming *arguendo* that all five second round systems are ultimately licensed, these systems and Teledesic would share the coordination burden on an equal footing with each other.

### **3. Employing Frequency Isolation**

In those cases where coordination agreements have not been reached, in-line interference can still be avoided through frequency isolation. Given that the likelihood of in-line events involving more than two systems is so small as to be insignificant, contingencies for frequency isolation in such a circumstance need not be considered. Accordingly, interference during in-line events could be avoided by simply dividing the available spectrum in two.<sup>5</sup> Each operator would, upon the launch of its first satellite, be entitled to specify one-half of the available primary spectrum (and one-half of the available secondary spectrum, if applicable) for its operations during in-line events.

This sharing approach would be the fallback if coordination of actions during in-line

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<sup>5</sup> This approach becomes more complicated when systems employing LEO constellations are taken into consideration, due to the fact that the number of in-line events associated with 90+ satellite LEO systems increases exponentially over the number of such events that are experienced with 15-30 satellite MEO systems. In the event of more than two systems being in alignment, the division of spectrum in two would be inadequate to avoid interference. Now, however, with Teledesic proposing to operate a MEO system, there is but one proposal for development of a LEO constellation in this band, and the prospects for future LEO operation are substantially diminished. To address the disparity between the number of in-line events that LEO and MEO systems would be responsible for, and the resulting inequity on the frequency isolation aspect of TRW's proposed sharing approach, it would be appropriate to limit the amount of spectrum available to a LEO system based either on the total number of systems deployed or upon the ratio of satellites in an operational LEO system to the average number of satellites in the operating MEO systems. For example, the amount of spectrum to which a LEO system would be entitled by default could be limited to  $1/n$  where  $n$  is greater than two (*i.e.*, to one-sixth of the band if all five second round NGSO FSS systems are licensed), rather than one-half. All other conditions described would apply as to selection of operating bands. In this fashion, the frequent in-line events caused by a LEO system would not lead to disproportionate use of shared spectrum.

events has not been successfully concluded with one or more operators. The system that launched earlier would pick its preferred spectrum band, and the selected band would become its default spectrum, with the remaining one-half of the band becoming the default spectrum of the later-launching system. The same approach would apply to each pair of operating systems. In the absence of other agreements or arrangements, each operator in a given system pair would be required to suspend operation in the default spectrum of the other operator in that pair during in-line events.

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Under the TRW approach, it is possible that six NGSO FSS systems could successfully share the band. Unlike the full segmentation options discussed below, this hybrid approach could provide all systems with adequate spectrum to enable each one to achieve economic viability. While this allotment may not be equivalent to the spectrum requests made by each of the applicants in their original applications, it nonetheless provides each prospective licensee with sufficient spectrum on an ongoing basis to fulfill its business plan.

**B. Neither the “Flexible Band Segmentation” Option Nor “Dynamic Band Segmentation” Option Would Provide Prospective Licensees With the Assurance That Adequate Spectrum Will Be Available for System Implementation.**

The first two spectrum sharing options proposed by the Commission – “flexible band segmentation” and “dynamic band segmentation”<sup>6</sup> – would not be well-suited by themselves to the needs of the current applicants and the constraints on spectrum use in the Ka-band. Under each of these approaches, the Commission would

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<sup>6</sup> See *NPRM* at 8-9 (¶¶ 19-24).

proceed in similar manner, with the available spectrum being divided  $1/n$ , where  $n$  is the number of systems to be licensed. The distinction between the two approaches lies in the point at which and the manner in which the value of " $n$ " would be determined.

In the case of "Flexible Band Segmentation," the Commission would establish identical spectrum blocks in each band at the outset, dividing the six available sub-bands by the number of licensed systems. No specific channel assignments would be made at the time of licensing, instead each operator would choose its spectrum assignments only after it had launched its first satellite and commenced transmissions. Once a system became operational and its operator had chosen specific bands in which to operate, the system would be protected in those bands against any subsequent system launching satellites, and later comers would have to protect the licensed system in its designated bands. The first operational system would also have access to all other spectrum in the subject bands, but would be required to coordinate use in these bands with other users once one or more additional systems become operational.

Under the "Dynamic Band Segmentation" approach, the same  $1/n$  model would be used, but the spectrum would not be divided into blocks at the outset. Instead, the value of  $n$  would fluctuate with the number of systems having operational satellites, and the amount of spectrum available for exclusive use by each licensee would change dynamically, and somewhat unpredictably, as new systems become operational. The first authorized Ka-band NGSO FSS network would have access to the entire spectrum in each of the sub-bands. Once a second system began operating a satellite, each band would be divided into two equal parts, and so on. For each re-division, the first system to launch would have the first selection of the portion of each band it desired to use.

The fundamental problem with each of these approaches is that if all of the systems currently proposed, including Teledesic, were to be licensed on such terms, the minimum amount of spectrum that would be available for each system – approximately 83 MHz in each direction (500 MHz/6 systems) – would not be sufficient to permit any operator to establish an economically viable business. TRW would not be able to make a broadband FSS system feasible in just 83 MHz of spectrum at Ka-band; it requires all 500 MHz of primary spectrum in each direction (although it can make the limited and short-term accommodations it describes in its proposed approach above).

Although the Commission notes in the *NPRM* “that it is possible, if not likely, that not all proposed systems will be implemented,”<sup>7</sup> it cannot count on this winnowing process to ensure that an adequate amount of spectrum will be available to allow all licensees that do launch to achieve commercial viability. Whether the Commission is correct in the end or not, the operational uncertainties created by the potential inadequacy of the spectrum that may ultimately be available to each licensee would pose a significant impediment to system operators seeking funding in the capital markets. Establishing a frequency allotment mechanism that undermines the confidence of the financial community, particularly in the current economic climate and following the spate of high profile project suspensions and bankruptcy filings in the satellite industry, would likely slow the acceptance of new technology and delay the availability of the new broadband services that the Ka-band NGSO FSS providers can offer. It is thus far from certain that the Commission is correct in its assessment that the Flexible

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<sup>7</sup> *NPRM* at 7 (¶ 15).

Band Segmentation approach, for example, would provide “sufficient certainty” for authorized systems to proceed with implementation. *NPRM* at 8 (¶ 21).

Adding to the shortcomings of this option is the fact that it is counterintuitive. As the Ka-band NGSO FSS service achieves success in the marketplace, with one or two systems supported by a growing user base, the amount of spectrum available to each on a dedicated basis could be substantially reduced as new systems, encouraged by the success of the first entrants, are initiated and select their frequency blocks. These later entrants would have tremendous leverage in coordination discussions, and the operating systems could lose spectrum, capacity or both at a time when more of each would be needed.

These same factors would also ensure that domestic coordination and regulatory oversight issues would remain prominent issues long after the issuance of licenses. For example, with operators guaranteed only a small portion of the available spectrum, the desire to make use of additional spectrum either guaranteed or potentially available to other licensees would very likely lead to intense and contentious coordination discussions. Given the stakes, and the difficult technical tradeoffs that will be required – as well as their impact on capacity, and therefore, competitiveness – the licensees themselves are very likely to be unable to resolve disputes through conventional means, necessitating frequent and time-consuming intervention by the Commission. This too creates undesirable uncertainty for licensees and their investors.

Finally, the Commission’s stated intent to establish spectrum rights as soon as an initial satellite is launched may not be appropriate for NGSO FSS systems. The presumption that a system has entered into service when its initial satellite has reached its intended orbit and initiated transmission is the appropriate point to consider

that the new network has been “brought into use” for ITU purposes. It does not follow, however, that this event is the point at which provision of service commences, because most or all of the NGSO FSS systems before the Commission for consideration will require multiple satellites to be in place before meaningful service can be provided. As a frequency selection mechanism, therefore, it may be more appropriate to await the achievement of meaningful operational capability before making permanent assignments of spectrum, as this is actually the stage when service can begin.

**C. Reliance On Avoidance of In-Line Events Alone, Without Employing Back-up Frequency Isolation Or Facilitating System Coordination, Would Be Problematic.**

As proposed, without the modifications proposed above, the Commission’s version of “Avoidance of In-Line Interference Events”<sup>8</sup> has some significant drawbacks. It is inherently complex in that it requires a degree of operator interaction that may be impractical to achieve in the real world.

This method could also impose very substantial cost penalties and spectrum inefficiencies for systems that are not designed to have satellite redundancy. For NGSO FSS systems that do not include the capability to practice satellite diversity, use of avoidance of in-line interference events as the basis for frequency assignments could significantly increase deployment costs for these systems while at the same time reducing their spectrum efficiency. Satellite diversity is thus not an appropriate all-purpose mechanism for interference avoidance.

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<sup>8</sup> See *NPRM* at 9-12 (¶¶ 25-32).



**D. Selection of A Homogenous Design for NGSO FSS Satellite Systems Is Not Viable In The Ka-Band.**

The Commission suggests as its fourth alternative the adoption of “one or more unifying constellation standards that could accommodate all Ka-band NGSO FSS systems,” *i.e.*, establishment of a homogeneity requirement for systems operating in the band. *NPRM* at 12 (¶ 33). Absent other defining characteristics or coordination agreements among the parties, however, there is no clear set of standards that could be derived from the current Ka-band processing group that would be a suitable template for implementation of a homogenous NGSO FSS constellation design in the Ka-band. None of the present system proposals suggests an optimal orbital architecture for use of the available spectrum that would allow the Commission to adopt the approach as a superior technical solution.

Establishment of mandatory criteria to optimize the phasing of satellites in identical orbits, and thus to minimize or even eliminate the occurrence of in-line events (depending on NGSO FSS design), may be the solution that a perfect marketplace would embrace for Ka-band NGSO FSS. It is not easily achievable, however, where applicants have designed systems of different types, each of which constitutes a credible design approach, but not one of which at this stage suggests that it should be preferred to exclusion of the others. It should be noted that the United States has presented a study by TRW on this issue to the ITU-R.<sup>9</sup> In this contribution, TRW showed that five NGSO FSS systems (three medium Earth orbit (“MEO”) and two low Earth orbit (“LEO”)) could share Ka-band spectrum with only limited coverage degradation if modest

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<sup>9</sup> See ITU-R Working Party 4A Document (4A/287), Working Document Toward a Draft New Recommendation on Frequency Sharing Between Multiple Non-Geostationary Fixed-Satellite Service (NGSO FSS) Systems in the 20/30 GHz Band, contribution of the United States of America (21 April 1999).

avoidance angles (4° to 7°) and harmonization of certain key parameters is imposed. This study can provide a basis for coordination efforts among the up to six NGSO FSS systems (five MEO and one LEO) now under consideration. Under these circumstances, it would be preferable for the Commission to take steps to encourage the optimization of constellations, with the expectation that this impetus, alongside powerful marketplace incentives, would foster some degree of post-licensing standardization, as outlined in Section A above.

### **III. Comments on Proposed Service Rules**

The Commission also seeks comment on a range of service rule proposals that build upon the rules currently applicable to Ka-band NGSO FSS satellite systems. *See NPRM* at 13 (¶ 38) *et seq.* TRW addresses the Commission’s proposed licensing and service rules in turn.

#### **A. Financial Qualifications.**

TRW supports the Commission’s tentative conclusion that the likelihood that “a spectrum sharing plan can be devised to accommodate all the pending applicants’ proposed systems and [allow] future entry” likely moots the need for a strict financial qualification standard at the outset.<sup>10</sup> The historic rationale for the use of a financial requirement—*i.e.*, to prevent under-financed applicants from depriving fully capitalized applicants from using the scarce spectrum resource — serves no meaningful purpose where, as in the case of the Ka-band NGSO FSS, the spectrum needs of all potential applicants can likely be accommodated through a thoughtful and carefully implemented sharing approach.

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<sup>10</sup> *See NPRM* at 14 (¶ 38).

The Commission states that it may impose a strict financial qualifications standard should it become apparent that the allocated spectrum cannot accommodate all potential applicants. In the event that the Commission does require a demonstration of financial capability, it should not alter the standard that it has previously employed.<sup>11</sup> TRW specifically opposes the Commission's suggestion that if a threshold financial requirement is used, it might "require the commitment of funds not previously committed to any other purpose," such that applicants would need "to demonstrate that they have assets or *committed financing* . . . separate and apart from any funding necessary to construct and operate any other licensed systems." *NPRM* at 14 (¶ 39) (emphasis added). Given the significance of the undertaking to construct a global NGSO satellite network and the lead time required to conceive, design, finance, construct, and launch such a system, it would be unrealistic to demand that applicants demonstrate access to all necessary funds at the time of initial licensing.

Even the largest companies engaged in a project as capital-intensive as a multiple satellite network must look to outside sources of funding through public debt, equity offerings or partner recruitment. Global investment from partners around the world is as much a practical requirement for implementation as it is a requirement from a risk management perspective. These funding sources cannot be tapped until a system's concept is demonstrated through successful FCC licensing. TRW therefore believes that even if the Commission ultimately looks to financial qualifications in licensing second

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<sup>11</sup> The Commission has recently initiated a more wide-ranging rulemaking concerning satellite licensing issues, including its financial standards, and any fundamental changes in the Commission's approach should be considered as part of that proceeding. *See Amendment of the Commission's Space Station Licensing Rules and Policies*, FCC 02-45, IB Dkts. 02-34 and 00-248, slip op. (released February 28, 2002).

round Ka-band NGSO FSS systems, the imposition of new financial requirements on satellite licensees beyond those now applicable would be inappropriate.

**B. Implementation Milestones.**

In lieu of imposing a modified financial qualification standard, the Commission should focus on adopting constructive and enforceable implementation milestones, which history has shown to be a valid and reasonable means of achieving the policy objectives underlying a financial demonstration. Unfortunately, the full system milestone showing proposed by the Commission in the *NPRM* substitutes complexity for certainty, and would likely prove overly burdensome both for applicants and the agency. The proposed schedule includes too many amorphous benchmarks and too few opportunities for meaningful and easily-administered enforcement. The tighter mid-course milestones projected come at the price of restricting an operator's flexibility to make mid-stream adjustments to its business model during implementation.

The Commission has specifically proposed that NGSO FSS licensees be required to enter into a non-contingent satellite manufacturing contract for the system within one year of authorization, complete critical design review within two years of authorization, begin physical construction of all satellites in the system within two and a half years of authorization, and complete construction and launch of the first two satellites within three and a half years of grant.<sup>12</sup> Some of these benchmarks mirror existing policy, and are reasonable, while others add to existing requirements without offering any clear benefits.

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<sup>12</sup> *NPRM*, FCC 02-30, slip op. at 14 (¶ 40).

Of these proposed milestones, the one requiring launch of the initial satellites within three and a half years of grant is the most problematic. None of the proposed systems could actually offer service based on the launch of just two satellites. The apparent motivation of this tight deployment deadline is meeting applicable ITU bringing into use deadlines, rather than actual implementation of service. However, the operators ultimately licensed in the second Ka-band NGSO FSS processing round should not, as a consequence of the length of time that it has taken to address regulatory and licensing issues in this processing round, be forced to meet tighter build-out schedules than applied to first round NGSO FSS licensees simply as an impetus to complete construction consistent with the time limits that apply to the relevant ITU registrations, and without regard to the ability to provide service. It would be preferable instead to have the United States (*i.e.*, the Commission) refile the registrations at the ITU rather than impose unrealistic milestones on licensees.

TRW believes that it would be both more appropriate and less burdensome to licensees and the Commission if NGSO FSS licensees were required to: (1) enter into a non-contingent satellite manufacturing contract covering the entire proposed system within 1 year of license grant; (2) commence physical construction of satellites within thirty months of grant (also as proposed by the Commission), and (3) bring into use its full constellation of satellites within six years of license grant (as the Commission has proposed). These streamlined milestones will ensure timely system commencement and completion (the ultimate goal of any implementation timetable) while still affording operators the flexibility they need to make mid-course changes in their system plans (at their own risk, and subject to the condition that the interference envelope of the system is not expanded).

The milestone schedule adopted by the Commission should also be flexible enough to allow licensees to phase in their networks over time. Allowing licensees to phase in service would permit them to change course in response to unexpected market conditions without altering the determination that the spectrum resource at issue is being put to the use most valuable to satellite system users. The Commission's goal should be ensuring that an appropriate level of service is being offered to the public on a timely basis consistent with market demand. The Commission should not insist upon reflexive adherence to a pre-established timetable for system build-out if marketplace demands have shifted. In such instance, the Commission's geographical coverage requirements should be applied only with respect to the network ultimately to be implemented.<sup>13</sup> Indeed, this approach is particularly appropriate with respect to services employing the first generation of new technology.<sup>14</sup>

At least some NGSO FSS systems in the Ka-band – particularly those that use orbits other than LEO – may be capable of staged implementation without sacrificing coverage capability or service to interested users. This aspect of the NGSO technology is an asset in that it will allow operators to roll out capacity on an incremental basis without having to establish an entire constellation before the first penny of revenue is earned. This feature is certain to make this service model more attractive to potential investors, as available capacity can be phased in at a rate commensurate with the level of consumer demand, and will allow for the more rapid and tailored introduction of new advanced

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<sup>13</sup> It is TRW's understanding that the Commission's coverage requirements apply to the ultimate capability of the system licensed, and do not limit the ability to achieve the required coverage in stages.

<sup>14</sup> See *United States Satellite Broadcasting, Inc.*, 3 FCC Rcd 6858, 6860 (¶ 14) (1988) (rejecting strict adherence to "a pre-established timetable set without the benefit of experience" with respect to first generation DBS system).

broadband service to the public. The result will be an increase in competition to existing satellite and terrestrial services.

Moreover, permitting the implementation of NGSO FSS in stages would not contravene the policy objectives of facilitating development of service and the efficient use of the limited available spectrum that underlie the Commission's milestone policies. Because NGSO systems are capable of sharing spectrum with other NGSO networks employing similar architecture, the failure of one licensee to implement service in accordance with its license would not result in idle spectrum. New operators can continue to be authorized upon application without reclaiming spectrum from previously licensed operators.

### **C. Reporting Requirements.**

In the *NPRM*, the Commission proposes to modify slightly the provisions of Section 25.145 of its rules concerning NGSO FSS reporting requirements.<sup>15</sup> Under these requirements, FSS licensees currently must file an annual report with the Commission describing, *inter alia*, the status of satellite construction and anticipated launch dates (including any major delays or problems encountered) and the use made of each satellite in orbit.<sup>16</sup> The Commission's proposal, however, would eliminate the existing requirement to report unscheduled satellite outages.<sup>17</sup>

TRW supports the Commission's decision to eliminate the unscheduled-outage reporting requirement. That requirement, designed to ensure that satellite

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<sup>15</sup> See *NPRM* at 14-15 (¶ 42).

<sup>16</sup> See 47 C.F.R. § 25.210(l).

<sup>17</sup> See *NPRM* at 15 (¶ 42).

spectrum resources are not warehoused in orbit, is unnecessary given the Commission's recognition that satellite spectrum will be available to all potential NGSO FSS applicants.

TRW believes that the proposal to require quarterly reports on milestone compliance, while offered with the constructive purpose of enhancing milestone enforcement, is unnecessary, and its costs would outweigh the intended benefits. *See NPRM* at 15 (¶ 42). Such a requirement would only add to the burdens placed on FCC staff resources without providing any obvious benefits in policing milestone compliance. Prompt milestone enforcement can be achieved through use of existing annual reporting requirements without unduly increasing the amount of staff time required to review additional milestone filings and consider opposition pleadings.

Regardless of the actual implementation milestones that are eventually adopted by the Commission, TRW supports the proposed requirement that operators certify compliance – or disclose of non-compliance – within 10 days following a milestone specified in the system authorization. *See NPRM* at 14 (¶ 40). Because satellite licenses contain self-effectuating terms that render them null and void upon failure to satisfy a construction deadline, it is critical for the Commission to be promptly informed concerning licensee performance, or non-performance, of its obligations. A certification requirement is one way to ensure that the Commission can stay abreast of which licenses remain valid, and which orbit and spectrum resources have become available for reassignment.

#### **E. Orbital Debris Mitigation**

The Commission proposes in the *NPRM* to adopt a requirement for Ka-band NGSO FSS systems that was previously employed for 2 GHz Mobile-Satellite Service Systems and has been proposed for Ku-band NGSO FSS systems, which would



impose on all applicants the obligation to disclose plans for mitigation of orbital debris.<sup>18</sup> More recently, the Commission has initiated the separate rulemaking proceeding referenced in the *NPRM*, in which it addresses a broader range of orbital debris issues.<sup>19</sup> TRW therefore believes that it is unnecessary to consider this issue in detail in this docket. It is prepared to comply with whatever reasonable policy the Commission adopts with respect to inclusion of orbital debris mitigation plans in initial satellite applications.

#### **F. System License and License Terms.**

The Commission has proposed the authorization of NGSO FSS licensees under a single blanket license for the construction, launch and operation of technically identical space stations and replacements.<sup>20</sup> TRW supports this approach, which mirrors the regulatory treatment accorded to NGSO systems in other bands. However, TRW disagrees with the Commission's proposal to make license terms run for just ten years from the date on which the first space station in the system begins transmitting and receiving radio signals.<sup>21</sup> The Commission has recently adopted changes in its rules establishing fifteen-year license terms for both GSO and NGSO satellites. TRW does not believe that there is any reason that Ka-band NGSO FSS licensees should not also be subject to this standard license term. Accordingly, the Commission should also adjust its proposed requirement for filing of replacement applications to specify that they be filed no earlier than three months prior to the end of the twelfth year of the existing license,

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<sup>18</sup> See *NPRM* at 15 (¶ 43).

<sup>19</sup> See *Mitigation of Orbital Debris*, FCC 02-80, IB Dkt. No. 02-54, slip op. (released March 18, 2002).

<sup>20</sup> See *NPRM* at 15 (¶ 44).

<sup>21</sup> See *id.* Here, it makes sense to use the commencement of transmission date, rather than the commencement of service date, as the transmissions require a license, and are objectively easier to identify than commencement of service.

unless circumstances warrant earlier filing, and no later than the end of the thirteenth year of the existing license.

#### IV. CONCLUSION

Based on the foregoing discussion, TRW urges the Commission to adopt a hybrid spectrum sharing solution for Ka-band NGSO FSS systems based on elements of several of the options that are discussed in the *NPRM*. The Commission should license each system to operate over all available Ka-band NGSO FSS spectrum, and require operators to coordinate spectrum use through a combination of system optimization, satellite diversity and situational frequency isolation, as applicable to the sharing circumstances between each licensed system. The Commission should also adopt additional NGSO FSS service rules for these bands consistent with these comments, and promptly act on the applications pending in the second Ka-band NGSO FSS processing round.

Respectfully submitted,

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